



To: Distribution
From: M. Newhouse
Date: November 15, 1996
Subject: Review of the IP&CL Command Table, October 25, 1996



The definition of the commands in the IP&CL is essential to the computation of AXAF mission planning and scheduling parameters and the formatting of AXAF commands by the AXAF OFLS.

The OFLS is in the final release for implementing the launch support mission planning and scheduling (MPS), command management (CM), attitude determination and sensor calibration (AD&SC), and interface and software support (ISS) subsystem functions. We are long past the cutoff date (Jan. 15, 1995) for the definition of the command information. Although significant improvement has been made in the definitions of the IP&CL command tables, they still lack information needed by the OFLS and are unclear in their definition. Based on our review of the latest version of the IP&CL, we generated this memorandum to identify outstanding command information still needed by the OFLS.

The major concerns based on the October 25, 1996 version of the IP&CL are:

- new commands (e.g., editing the star catalog) requiring OFLS support that have been added without update to the ICD and review by the system
- missing units for command parameters

OFLS Command Data Needs

The results of the review are presented in a set of tables in three attachments.

- Table A-1 in Attachment A is extracted from Activity Descriptions (Section 3.1) of AMO-3140, the Operations Data Base User's Guide. This is the list of command parameters provided by the OFLS MPS.
- The OFLS AD&SC computes the parameters shown in table A-2 of Attachment A.
- Table A-3 in Attachment A is extracted from Section 4.5.3 of AMO-2310, the AXAF OFLS Software Design Specification. This is the list of command parameters provided by the OFLS ISS.
- Table A-4 of Attachment A is a list of new multipart commands have been added to the IP&CL that are not supported by the current OFLS design. These are shown without any reference to an OFLS subsystem or variable name.
- The table in Attachment B is extracted from of the AXAF Characteristics (Section 3.2) of AMO-3140. The list of command mnemonics the OFLS CM uses for specific purposes when building stored command or software loads is provided in the ODB_Command_Characteristics Record.
- The table in attachment C lists the data type processing the OFLS CM supports, extracted from Section 4.2.1. of AMO-2310.

The tables show the best guess at the command or command parameter mnemonics that correspond to the OFLS values of interest. There are three different cases for this correspondence.

- Only one mnemonic is listed - In this case, we request that TRW verify that the listed mnemonic identifies the correct command or command parameter.
- More than one mnemonic is listed - In this case, we request that TRW identify the appropriate mnemonic(s).
- No mnemonic is listed - In this case, we could not identify any command or command parameter that corresponded to the OFLS item of interest. We request that TRW identify the appropriate item.

ATTACHMENT A

OFLS MPS COMMAND PARAMETER DATA NEEDS

These tables list the uplink parameters that the OFLS MPS, AD&SC, and ISS subsystems expect to provide to AXAF-I. The tables are based on Section 3.1 in AMO-3140, Operations Data Base User's Guide and AMO-2310, the AXAF OFLS Software Design Specification, according to the version of Section 3.1 that will be published in the baseline review version of AMO-3140. It has been updated to include new multipart command definitions in the IP&CL which are currently not defined in the ICD, AMO-3140, or in AMO-2310 but that should be supported by the OFLS processing. New entries that are currently not supported are indicated by italics

The column definitions are:

Column	Definition
MPS Command Parameter Name	OFLS MPS software name used to identify the command parameter
Description	A short description of the command parameter
IPCL Mnemonic	IP&CL mnemonic for the value. The entry is based on the IP&CL Command Table provided in the version received by OFLS on October 25, 1996. References to mnemonics within multipart command record mnemonics are shown by concatenating the two mnemonics, separated by a period: "record_mnemonic.mnemonic". If the field type indicates that the mnemonic will required further breakdown to be processed by the OFLS (e.g., QUAT for quaternions), this is shown by concatenating the field type: "record_mnemonic.mnemonic.type".
ICD Name	The applicable reference (if any) in CM07d, the AXAF-I to AXAF-I OCC ICD. References are based on the September 5, 1996 version of the ICD, which was originally understood to be the baseline version.
Comment	Comment or question requesting clarification of the command value(s)

Table A.1 - MPS Uplink Parameters

MPS Uplink Parameters				
MPS Command Parameter Name	Description	IPCL Mnemonic	ICD Reference, Name	Comment
Q1	First component of the spacecraft attitude quaternion at the end of the maneuver in the ECI frame	AOUPTARQ.AOTARCMD.QUAT xAOATTUP	Section 6.1.3.3, TBD	<ul style="list-style-type: none"> The OFLS cannot process the quaternion format currently defined in the IP&CL. The structure definition must be defined at the level of a single number, i.e., a mnemonic within the structure for each component of the quaternion.
Q2	Second component of the spacecraft attitude quaternion at the end of the maneuver in the ECI frame	AOUPTARQ.AOTARCMD.QUAT xAOATTUP	Section 6.1.3.3, TBD	<ul style="list-style-type: none"> See comment above for Q1
Q3	Third component of the spacecraft attitude quaternion at the end of the maneuver in the Earth-centered inertial (ECI) frame	AOUPTARQ.AOTARCMD.QUAT xAOATTUP		<ul style="list-style-type: none"> See comment above for Q1
NAQSTAR	Number of acquisition stars or FID lights (up to a maximum of 8) for uplink to the spacecraft		6.1.5, TBD	<ul style="list-style-type: none"> Not in the IP&CL command structure table; replace with AONUMENT?
AQKFAB	Correction for aberration flag	XOSTABFF XOSTABFT		
AQDSAB	Correction for aberration flag	XOSTABFF XOSTABFT		
AQIMn	Image number for the first acquisition star or FID light	AOSTRCAT.AOREFCAT.AOIMNUM	6.1.5, Im_Num	<ul style="list-style-type: none"> Does not match the ICD. IP&CL description states that AOREFCAT contains 16 star catalog entries with unused entries zero-filled. The ICD states that Ref_Cat can contain up to 16 entries.
AQYn	Expected y-angular location (column) in the ACA field of view for the first acquisition star or FID light (radians)	AOSTRCAT.AOREFCAT.AOYANGLE	6.1.5, Y_Angle	<ul style="list-style-type: none"> See comment above for AQIMn

MPS Uplink Parameters				
MPS Command Parameter Name	Description	IPCL Mnemonic	ICD Reference, Name	Comment
AQZn	Expected z-angular location (column) in the ACA field of view for the first acquisition star or FID light (radians)	AOSTRCAT.AOREFCAT.AOZANGLE	6.1.5, Z_Angle	• See comment above for AQIMn
AQMMAXn	Bright magnitude limit of the first acquisition star or FID light	AOSTRCAT.AOREFCAT.AOMAXMAG	6.1.5, Min_Mag	• See comment above for AQIMn
AQMMINn	Faint magnitude limit of the first acquisition star or FID light	AOSTRCAT.AOREFCAT.AOMINMAG	6.1.5, Max_Mag	• See comment above for AQIMn
AQBOXn	Search region dimension for the first acquisition star or FID light	AOSTRCAT.AOREFCAT.AODIMDTS	6.1.5, Acq_Dim_or_DTS	• Units are defined as “nd”, but should have dimensions of “pixels”
AQRESn	High resolution flag for acquisition/guide stars for the first acquisition star or FID light	AOSTRCAT.AOREFCAT.AORESTRK	6.1.5, Acq_Res_or_Track	• See comment above for AQIMn
AQMONn	Convert to track flag for monitor windows for the first acquisition star or FID light	AOSTRCAT.AOREFCAT.AORESTRK	6.1.5, Acq_Res_or_Track	• See comment above for AQIMn
AQDTSn	Designated tracked star for the monitor window using the first acquisition star (integer number from 0 to 7)	AOSTRCAT.AOREFCAT.AODIMDTS	6.1.5, Acq_Dim_or_DTS	• See comment above for AQIMn
AQSIZEn	Image size code for the first acquisition star or FID light	AOSTRCAT.AOREFCAT.AOIMSIZE	6.1.5, Image_Size	• See comment above for AQIMn
AQFLGn	Acquisition/Guide star flag for the first acquisition star	AOSTRCAT.AOREFCAT.AOENTYPE	6.1.5, Entry_Type	• See comment above for AQIMn
NAGSTAR	Number of guide stars or FID lights (up to a maximum of 8) for uplink to the spacecraft		6.1.5, TBD	• See comment above for NAQSTAR
AGIMn	Image number for the first guide star or FID light	AOSTRCAT.AOREFCAT.AOIMNUM	6.1.5, Im_Num	• See comment above for AQIMn
AGYn	Expected y-angular location (column) in the ACA field of view for the first guide star or FID light (radians)	AOSTRCAT.AOREFCAT.AOYANGLE	6.1.5, Y_Angle	• See comment above for AQIMn
AGZn	Expected z-angular location (column) in the ACA field of view for the first guide star or FID light (radians)	AOSTRCAT.AOREFCAT.AOZANGLE	6.1.5, Z_Angle	• See comment above for AQIMn

MPS Uplink Parameters				
MPS Command Parameter Name	Description	IPCL Mnemonic	ICD Reference, Name	Comment
AGMMAXn	Bright magnitude limit of the first guide star or FID light	AOSTRCAT.AOREFCAT.AOMAXMAG	6.1.5, Min_Mag	• See comment above for AQIMn
AGMINn	Faint magnitude limit of the first guide star or FID light	AOSTRCAT.AOREFCAT.AOMINMAG	6.1.5, Max_Mag	• See comment above for AQIMn
AGBOXn	Search region dimension for the first guide star or FID light	AOSTRCAT.AOREFCAT.AODIMDTS	6.1.5, Acq_Dim_or_DTS	• See comment above for AQBOXn
AGRESn	High resolution flag for acquisition/guide stars for the first acquisition star or FID light	AOSTRCAT.AOREFCAT.AORESTRK	6.1.5, Acq_Res_or_Track	• See comment above for AQIMn
AGMONn	Convert to track flag for monitor windows for the first acquisition star or FID light	AOSTRCAT.AOREFCAT.AORESTRK	6.1.5, Acq_Res_or_Track	• See comment above for AQIMn
AGDTSn	Designated tracked star for the monitor window using the first guide star (integer number from 0 to 7)	AOSTRCAT.AOREFCAT.AORESTRK	6.1.5, Acq_Dim_or_DTS	• See comment above for AQIMn
AGSIZEEn	Image size code for the first acquisition star or FID light	AOSTRCAT.AOREFCAT.AOIMSIZE	6.1.5, Image_Size	• See comment above for AQIMn
AGFLGn	Acquisition/Guide star flag for the first guide star or FID light	AOSTRCAT.AOREFCAT.AOENTYPE	6.1.5, Entry_Type	• See comment above for AQIMn
		<i>AOSTRCAT.AOREFCAT.AONUMENT</i>		• <i>This parameter is not defined in AMO-3140. This value has not been implemented in the OFLS.</i>
SYSMOM	Desired system angular momentum at the end of the onboard momentum dump for each AXAF-I body axis (kilogram-meter ² /second)	AODESMOM.AOMOMTOT	6.1.6, TBD	• Units are not defined in the IP&CL.
TRANS	Transmitter to be turned on for ground communications	CTXAON CTXBON		
ACIS	ACIS identifier. Allowed values are "ACIS-I" or "ACIS-S"			
ACIS_MODE	ACIS operational mode identifier. Used as a			

MPS Uplink Parameters				
MPS Command Parameter Name	Description	IPCL Mnemonic	ICD Reference, Name	Comment
	lookup into ACIS table data element to obtain the correct ACIS parameter block for uplink in the stored command load			
HRC	HRC identifier. Allowed values are "HRC" or "HRC"			
HRC_MODE	HRC operational mode identifier.			
TSC_POS	Desired position for the translating science compartment (TCS) in TSC motor steps	xSIMGOTO.SIMGOTO1, xSIMGOTO.SIMGOTO2	6.1.3, Go To Address	<ul style="list-style-type: none"> Units are not defined in the IP&CL. Not marked as a structure in the command table, but defined in the command structure table
FA_POS	Desired position for the focused assembly (FA) in FA motor steps	xSIMGOTO.SIMGOTO1, xSIMGOTO.SIMGOTO2	6.1.3, Go To Address	<ul style="list-style-type: none"> See comment above for TSC_POS
GRATING	Grating identifier. Allowed values are "HETG", "LETG,", or "NONE"			
YAMP	y amplitude (radians)	AODITPAR.AOANGP	6.1.4, TBD	<ul style="list-style-type: none"> Units are not defined in the IP&CL.
ZAMP	z amplitude (radians)	AODITPAR.AOANGY	6.1.4, TBD	<ul style="list-style-type: none"> Units are not defined in the IP&CL.
YFREQ	y frequency (radians/second)	AODITPAR.AORATEP	6.1.4, TBD	<ul style="list-style-type: none"> Units are not defined in the IP&CL.
ZFREQ	z frequency (radians/second)	AODITPAR.AORATEY	6.1.4, TBD	<ul style="list-style-type: none"> Units are not defined in the IP&CL.
YPH	y phase (radians)	AODITPAR.AOPHASEP	6.1.4, TBD	<ul style="list-style-type: none"> Units are not defined in the IP&CL.
ZPH	z phase (radians)	AODITPAR.AOPHASEY	6.1.4, TBD	<ul style="list-style-type: none"> Units are not defined in the IP&CL.

Table A.2 - AD&SC Uplink Parameters

AD&SC Uplink Parameters - PCAD OBC Constants				
AD&SC Command Parameter Name	Description	IPCL Mnemonic	ICD Reference, Name	Comment
DELTA_Q1	First component of the spacecraft	AOATTUP.AOQATTUP	Section 6.1.3.1,	<ul style="list-style-type: none"> The OFLS cannot process the attitude

AD&SC Uplink Parameters - PCAD OBC Constants				
AD&SC Command Parameter Name	Description	IPCL Mnemonic	ICD Reference, Name	Comment
	correction quaternion		TBD; Section 6.1.3.2, TBD	update format currently defined in the IP&CL. The structure definition must be defined at the level of a single number, i.e., a mnemonic within the structure for each component of the quaternion.
DELTA_Q2	Second component of the spacecraft attitude correction quaternion	AOATTUP.AOQATTUP	Section 6.1.3.3, TBD	<ul style="list-style-type: none"> See comment above for DELTA_Q1
DELTA_Q3	Third component of the spacecraft attitude correction quaternion	AOATTUP.AOQATTUP		<ul style="list-style-type: none"> See comment above for DELTA_Q1
GYRO_BIAS	Update gyro bias estimate	AOBIASUP.AODRIFT	Section 6.1.9.1, TBD	<ul style="list-style-type: none"> The current ICD shows these values as a table (absolute memory)load. The OFLS is still expecting an ECR defining which table parameters have been changed to commands. The OFLS cannot process the bias update format currently defined in the IP&CL. The structure definition must be defined at the level of a single number, i.e., a mnemonic within the structure for each component of the vector. Units are not defined in the IP&CL.
GYRO_MSALIGN	3x3 matrix of gyro scale factor and misalignment coefficients	????	Section 6.1.9.2, KP.G_Misalignment	<ul style="list-style-type: none"> Not defined in the IP&CL.

Table A.3 - ISS Uplink Parameters

ISS Uplink Parameters - OBC Coefficients				
ISS Command Parameter Name	Description	IPCL Mnemonic	ICD Reference, Name	Comment
GAUSS_C	Square root of the ratio of the distance from apogee to perigee	AOEPHMUP.AORATIO	6.1.7, KP.A2P_Ratio	<ul style="list-style-type: none"> The OFLS has implemented these values according to the current ICD, which shows these values as a table (absolute memory) load. The OFLS is still expecting an ECR defining which table parameters have been changed to commands. Units are not defined in the IP&CL
APERIG	Argument of perigee	AOEPHMUP.AOARGPER	6.1.7, KP.Arg_Perigee	<ul style="list-style-type: none"> See comment above for GAUSS_C
ECC	Orbital eccentricity	AOEPHMUP.AOECCENT	6.1.7, KP.Eccentricity	<ul style="list-style-type: none"> See comment above for GAUSS_C
M_COS_I	$(1-\cos(i))/2$, where i is the orbital inclination	AOEPHMUP.AO1MINUS	6.1.7, KP.Half_1mCosI	<ul style="list-style-type: none"> See comment above for GAUSS_C
P_COS_I	$(1+\cos(i))/2$, where i is the orbital inclination	AOEPHMUP.AO1PLUS	6.1.7, KP.Half_1pCosI	<ul style="list-style-type: none"> See comment above for GAUSS_C
MEANM	Mean orbital motion	AOEPHMUP.AOMOTION	6.1.7, KP.Mean_Motion	<ul style="list-style-type: none"> See comment above for GAUSS_C
????	<i>Number of iterations</i>	<i>AOEPHMUP.AOITERAT</i>	<i>????</i>	<ul style="list-style-type: none"> <i>This parameter is not defined in the ICD, nor the OFLS SDS. This value has not been implemented in the OFLS.</i>
ORB_MOM	Specific orbital angular momentum	AOEPHMUP.AOORBANG	6.1.7, KP.Orb_Ang_Mom	<ul style="list-style-type: none"> See comment above for GAUSS_C
T_PERIG	Time of perigee passage	AOEPHMUP.AOPERIGE	6.1.7, KP.Perigee_Time	<ul style="list-style-type: none"> See comment above for GAUSS_C
RANODE	Right ascension of the ascending node	AOEPHMUP.AOASCEND	6.1.7, KP.RA_Ascend_Node	<ul style="list-style-type: none"> See comment above for GAUSS_C
SIN_I	$\sin(i)$, where i is the orbital inclination	AOEPHMUP.AOSINI	6.1.7, KP.SinI	<ul style="list-style-type: none"> See comment above for GAUSS_C
SEMI_LR	Semilatus rectum	AOEPHMUP.AOSLR	6.1.7, KP.SLR	<ul style="list-style-type: none"> See comment above for GAUSS_C

ISS Uplink Parameters - OBC Coefficients				
ISS Command Parameter Name	Description	IPCL Mnemonic	ICD Reference, Name	Comment
SQRT_MU_A E	$(\mu * a * e^2)^{1/2}$	AOEPHMUP.AOSQRTMU	6.1.7, KP.Sqrt_Mu_A_ Esq	<ul style="list-style-type: none"> See comment above for GAUSS_C

Table A.4 - Multipart Command Uplink Parameters Not Currently Supported by the OFLS Design

Uplink Parameters - Not Supported by OFLS				
ISS Command Parameter Name	Description	IPCL Mnemonic	ICD Reference, Name	Comment
????	<i>Fid light control prime (FLCA-A)</i>	<i>AFIDP.AFIDP0n; where n = 1,6</i>	????	<ul style="list-style-type: none"> Should these parameter be added to OP-19 and the AXAF-I to OCC ICD?
????	<i>Fid light control redundant (FLCA-B)</i>	<i>AFIDR.AFIDR0n; where n = 1,6</i>	????	<ul style="list-style-type: none"> Should these parameter be added to OP-19 and the AXAF-I to OCC ICD?
????	<i>Update bright star parameters</i>	<i>AOBRIPAR.AOBRIMAX, AOBRIPAR.AOBRIMIN,</i>	????	<ul style="list-style-type: none"> Should these parameter be added to OP-19 and the AXAF-I to OCC ICD? Appears in command structures table only, no reference to this structure in the command table
????	<i>Set ACA integration time</i>	<i>AOSETINT.AOACTIME</i>	????	<ul style="list-style-type: none"> Should these parameter be added to OP-19 and the AXAF-I to OCC ICD?
????	<i>Edit OBC star catalog entry</i>	<i>AOEDITCT.AOENTRY, AOEDITCT.AOCATENT.REFCAT AOEDITCT.AOACXREF</i>	????	<ul style="list-style-type: none"> Should these parameter be added to OP-19 and the AXAF-I to OCC ICD? See REFCAT entries for acquisition and guide stars above
????	<i>Update acquisition star reference parameters</i>	<i>AOACQPAR.AOACQADJ, AOACQPAR.AOACSZSF, AOACQPAR.AOACTHSF, AOACQPAR.AOACQSEL, AOACQPAR.AOACDELY, AOACQPAR.AOACDELZ</i>	????	<ul style="list-style-type: none"> Should these parameter be added to OP-19 and the AXAF-I to OCC ICD?

Uplink Parameters - Not Supported by OFLS				
ISS Command Parameter Name	Description	IPCL Mnemonic	ICD Reference, Name	Comment
????	<i>Update guide star reference parameters</i>	AOGUIPAR.AOGUIADJ, AOGUIPAR.AOGUSZSF, AOGUIPAR.AOGUTHSF, AOGUIPAR.AOGUIDIM, AOGUIPAR.AOGUIRES, AOGUIPAR.AOGUISEL, AOGUIPAR.AOGUDELY, AOGUIPAR.AOGUDELZ	????	<ul style="list-style-type: none"> Should these parameter be added to OP-19 and the AXAF-I to OCC ICD?
????	<i>Update fiducial light reference parameters</i>	AOFIDPAR.AOFIDADJ, AOFIDPAR.AOFISZSF, AOFIDPAR.AOFITHSF, AOFIDPAR.AOFIDDIM, AOFIDPAR.AOFIDRES, AOFIDPAR.AOFIDSEL, AOFIDPAR.AOFIDELY, AOFIDPAR.AOFIDELZ	????	<ul style="list-style-type: none"> Should these parameter be added to OP-19 and the AXAF-I to OCC ICD?
????	<i>Set maneuver profile parameters</i>	AOMANPAR.AOJERK, AOMANPAR.AOOMEGA, AOMANPAR.AOALPMAX	????	<ul style="list-style-type: none"> Should these parameter be added to OP-19 and the AXAF-I to OCC ICD?

ATTACHMENT B

OFLS CM COMMAND DATA NEEDS

This table lists the command mnemonics that the OFLS CM subsystem expects to utilize when building stored command and software loads for AXAF-I. The following is taken from the ODE_COMMAND_CHARACTERISTICS record in Section 3.2 of AMO-3140, Operations Data Base User's Guide. It corresponds to the version of Section 3.1 that will be published in the baseline review version of AMO-3140.

The column definitions are:

Column	Definition
CM Command Mnemonic Name	OFLS CM software name used in AMO-3140 to identify the command mnemonic
Description	A short description of the command mnemonic
IPCL Mnemonic	IP&CL mnemonic for the value. The entry is based on the IP&CL Command Table provided in the version received by OFLS on June 28, 1996.
Comment	Comment or question requesting clarification of the command value(s)

CM Command Mnemonics			
CM Command Mnemonic Name	Description	IPCL Mnemonic	Comment
odb_abs_time_wait	Defines the command mnemonic for the absolute time delay command	COSATDLY	
odb_rel_time_wait	Defines the command mnemonic for the relative time delay command	COSRTDLY	
ode_clear_obc_buf	Defines the command mnemonic for the clear memory load buffer command	CORMLCLR	
ode_complete_obc_buf	Defines the command mnemonic for the complete memory load command	CORMEMLD	
ode_obc_buf_chksum	Defines the command mnemonic for the OBC checksum command	xOBCALD4.XOBCALD41	<ul style="list-style-type: none"> • Not identified as a structure, but defined in the command structure table
ode_call_scs	Defines the command mnemonic for the call SCS command	COSCALL	
ode_scs_buf_header	Defines the command mnemonic for the SCS load buffer header command	xOBCSLD1	<ul style="list-style-type: none"> • See comment above for ode_obc_buf_chksum
???	<i>OBC - Store Command Load - Block Header</i>	<i>xOBCSLD2</i>	<ul style="list-style-type: none"> • See comment above for ode_obc_buf_chksum • Not in the current OFLS design; requires an update to AMO-3140
ode_scs_buf_chksum		xOBCSLD4	<ul style="list-style-type: none"> • no longer needed • the ICD only references an uplink buffer checksum, not a SCS load checksum
ode_mem_ld_header	Defines the command mnemonic for the absolute memory load header command	xOBCALD1	<ul style="list-style-type: none"> • See comment above for ode_obc_buf_chksum
???	<i>OBC - Absolute Address Load - Block Header</i>	<i>xOBCALD2</i>	<ul style="list-style-type: none"> • See comment above for ode_obc_buf_chksum • Not in the current OFLS design; requires an update to AMO-3140
ode_mem_ld_chksum		xOBCALD4	<ul style="list-style-type: none"> • no longer needed

CM Command Mnemonics			
CM Command Mnemonic Name	Description	IPCL Mnemonic	Comment
			<ul style="list-style-type: none"> the ICD only references an uplink buffer checksum, not an absolute memory load checksum
ode_scs_blk_header	Defines the command mnemonic for the SCS load block header command	xOBCSLD2	<ul style="list-style-type: none"> Not identified as a structure, but defined in the command structure table
ode_mem_blk_header	Defines the command mnemonic for the absolute memory load block header command	xOBCALD2	<ul style="list-style-type: none"> See comment above for ode_obc_buf_chksum
ode_mem_ld_cmd	Defines the command mnemonic for the absolute memory load command	xOBCALD3	<ul style="list-style-type: none"> See comment above for ode_obc_buf_chksum
ode_scs_ld_cmd	Defines the command mnemonic for the SCS load command	xOBCSLD3	<ul style="list-style-type: none"> See comment above for ode_obc_buf_chksum
ode_end_scs	Defines the command mnemonic for the end SCS command	COSSEND	
ode_mem_ld_hd_cmd	Defines the command mnemonic for the hardware OBC memory load command		
ode_cpe_mem_ld	Defines the command mnemonic for the CPE RAM load command		
ode_iu_mem_ld	Defines the command mnemonic for the IU EEPROM load command	CIULdAdd	
ode_ctu_mem_ld	Defines the command mnemonic for the CTU EEPROM load command	CIURPMLD	
ode_cpe_buf_header	Defines the command mnemonic for the CPE RAM load buffer header command	xCPEALD1	<ul style="list-style-type: none"> See comment above for ode_obc_buf_chksum
ode_cpe_buf_data			<ul style="list-style-type: none"> no longer needed
ode_cpe_complete_buf	Defines the command mnemonic for the CPE RAM complete load command	xCPELCB1 xCPELCB2	<ul style="list-style-type: none"> The OFLS is expecting one mnemonic for load complete and one mnemonic for load clear
ode_cpe_clear_buf	Defines the command mnemonic for the CPE RAM clear buffer command	xCPELCB1 xCPELCB2	<ul style="list-style-type: none"> See comment above for

CM Command Mnemonics			
CM Command Mnemonic Name	Description	IPCL Mnemonic	Comment
			ode_cpe_complete_buf
ode_cpe_ld_chksum	Defines the command mnemonic for the CPE RAM checksum command	xCPEALD4.CPEALD42 xCPEALD4.CPEALD44 xCPEALD5.CPEALD52 xCPEALD5.CPEALD54	<ul style="list-style-type: none"> • See comment above for ode_obc_buf_chksum • The OFLS cannot process this field as defined. The OFLS cannot split a data value (checksum) across two field mnemonics
ode_aca_buf_header	Defines the command mnemonic for the ACA processor load header command	AACAMUP	
ode_aca_buf_data	Defines the command mnemonic for the ACA processor load data command		
ode_aca_buf_chksum	Defines the command mnemonic for the ACA processor load checksum command	AACAMUP.AACAMUPS	<ul style="list-style-type: none"> • The OFLS is expecting a command mnemonic, not a field mnemonic for the ACA memory load checksum
ode_ld_acis_cmd	Defines the command mnemonic for the ACIS load command		
ode_ioe_cmd	Defines the command mnemonic for the IOE command		
ode_ld_rt_cmd	Defines the command mnemonic for the real time load command		
odb_ld_rt_data_fd	Defines the field mnemonic for the data field in the real-time load data command		
odb_scs_ld_data_fd	Defines the field mnemonic for the data field in the SCS load command	xOBCSLD3.XOBCSLD1	
odb_mem_ld_data_fd	Defines the field mnemonic for the data field in the absolute memory load command	xOBCALD3.XOBCAL20	
odb_cpe_ld_data_fd	Defines the field mnemonic for the data field in the CPE RAM load data command		
odb_iu_ld_data_fd	Defines the field mnemonic for the data field in the IU EEPROM load data command		

CM Command Mnemonics			
CM Command Mnemonic Name	Description	IPCL Mnemonic	Comment
odb_ctu_ld_data_fd	Defines the field mnemonic for the data field in the CTU EEPROM load data command		
odb_aca_ld_data_fd	Defines the field mnemonic for the data field in the ACA processor load data command		
odb_scs_hdr_blk_ct	Defines the field mnemonic for the block count field in the SCS load buffer header command	xOBCSLD2.XOBCSLD13	
odb_scs_hdr_buff_ct	Defines the field mnemonic for the buffer command count field in the SCS load buffer header command	xOBCSLD2.XOBCSLD14	
odb_scs_hdr_step_ct	Defines the field mnemonic for the SCS step counter data field in the SCS load block header command	xOBCSLD2.XOBCSLD21	
odb_scs_hdr_id	Defines the field mnemonic for the SCS id field in the SCS load block header command	xOBCSLD2.XOBCSLD22	
odb_scs_hdr_cmd_ct	Defines the field mnemonic for the SCS command count field in the SCS load block header command	xOBCSLD2.XOBCSLD24	
odb_mem_hdr_blk_ct	Defines the field mnemonic for the block count field in the absolute memory load buffer header command	xOBCSLD2.XOBCSLD23	
odb_mem_hdr_buff_ct	Defines the field mnemonic for the buffer command count field in the absolute memory load buffer header command	xOBCALD1.XOBCAL004	
odb_mem_hdr_cmd_ct	Defines the field mnemonic for the 16-bit word count field in the absolute memory load block header command	xOBCALD2.XOBCAL12	
odb_mem_hdr_addr	Defines the field mnemonic for physical address field in the absolute memory load block header command	xOBCALD2.XOBCAL10 xOBCALD2.XOBCAL11	<ul style="list-style-type: none"> The OFLS requires one mnemonic for a single data value, the physical address cannot be split across two field mnemonics

ATTACHMENT C

OFLS CM COMMAND DATA TYPE NEEDS

This table lists the command mnemonics that the OFLS CM subsystem expects to utilize when building stored command and software loads for AXAF-I. The following is a listing of the data types supported as defined in AMO-2310, AXAF OFLS Software Design Specification. It corresponds to the version of Section 4.2.1 that is published in the Release 2 as-built version of AMO-2310.

The column definitions are:

Column	Definition
Description	A short description of the data type
IPCL Mnemonic	IP&CL mnemonic for the value. The entry is based on the IP&CL Command Table provided in the version received by OFLS on June 28, 1996.
Comment	Comment or question requesting clarification of the data type(s)

CM Command Parameter Data Types		
Description	IPCL Mnemonic	Comment
32 bit MIL-STD-1750 floating point	1750FL	<ul style="list-style-type: none"> • Is this portion of the IP&CL under level 2 configuration control?
48 bit MIL-STD-1750 floating point	1750FLx	<ul style="list-style-type: none"> • Is this portion of the IP&CL under level 2 configuration control?
2 to 32 bit two's complement signed integer	1750FP 1750FPD	<ul style="list-style-type: none"> • Is this portion of the IP&CL under level 2 configuration control?
2 to 32 bit unsigned integer		
1 bit discrete		
16 bit data word count		
20 bit data word count		
even parity		
odd parity		
3 bit sequential counter		
ACA, SIM, EPHIN checksum		
CPE buffer checksum		
OBC uplink buffer checksum		

Name	Description	Range	Units	Destination
THE FOLLOWING K-CONSTANTS HAVE BEEN CONVERTED TO COMMANDABLE PARAMETERS NOW CONTAINED IN THE COMMAND "UPDATE SPACECRAFT EPHEMERIS"				
KP.A2P_Ratio	Square root of ratio of apogee to perigee distance: [(1 + e) / (1 - e)]^(1/2)	TBS	ND	Spacecraft Ephemeris
KP.Arg_Perigee	Argument of perigee	TBS	rad	Spacecraft Ephemeris
KP.Eccentricity	Orbital eccentricity (e)	TBS	ND	Spacecraft Ephemeris
KP.Half_1mCosI	(1 - cos i) / 2 (i = orbital inclination)	TBS	ND	Spacecraft Ephemeris
KP.Half_1pCosI	(1 + cos i) / 2 (i = orbital inclination)	TBS	ND	Spacecraft Ephemeris
KP.Mean_Motion	Mean orbital motion: (Mu / a^3)^(1/2)	TBS	s ⁻¹	Spacecraft Ephemeris
KP.Num_Iterations	Number of iterations for the solution of Kepler's equation	TBS	ND	Spacecraft Ephemeris
KP.Orb_Ang_Mom	Specific orbital angular momentum, h: [Mu * a * (1 - e^2)]^(1/2)	TBS	m ² s ⁻¹	Spacecraft Ephemeris
KP.Perigee_Time	Time of perigee	TBS	s	Spacecraft Ephemeris
KP.RA_Ascend_Node	Right ascension of the ascending node	TBS	rad	Spacecraft Ephemeris
KP.SinI	sin i (i = orbital inclination)	TBS	ND	Spacecraft Ephemeris
KP.SLR	Semilatus rectum: (h^2 / Mu) = a * (1 - e^2)	TBS	m	Spacecraft Ephemeris
KP.Sqrt_Mu_A_Esq	(Mu * a * e^2)^(1/2)	TBS	m ² s ⁻¹	Spacecraft Ephemeris
THE FOLLOWING K-CONSTANTS HAVE BEEN CONVERTED TO COMMANDABLE PARAMETERS NOW CONTAINED IN THE COMMAND "UPDATE ACQUISITION STAR REFERENCE PARAMETERS"				
KP.Acq_Delta_Y_Thresh	Acquisition star delta-Y threshold	TBS	rad	Identify Acquisition Stars
KP.Acq_Delta_Z_Thresh	Acquisition star delta-Z threshold	TBS	rad	Identify Acquisition Stars
KP.Acq_F_Adj	Search parameters adjustment flag	'NONE', 'SIZE' or 'BRIGHT'	ND	Acquisition Star Processing
KP.Acq_Select	Image selection criterion (brightness or position)	'BRIGHT' or 'POS'	ND	Acquisition Star Processing
KP.Acq_Size_SF	Acquisition star window size scale factor	TBS	ND	Acquisition Star Processing
KP.Acq_Thresh_SF	Acquisition star brightness threshold scale factor	TBS	ND	Acquisition Star Processing
THE FOLLOWING K-CONSTANTS HAVE BEEN CONVERTED TO COMMANDABLE PARAMETERS NOW CONTAINED IN THE COMMAND "SET MANUEVER PROFILE PARAMETERS"				
KP.Alpha_Max(PCAD Modes)	Maximum acceleration	TBS	rad/s ²	Attitude Command Generation
KP.Omega_Max(PCAD Modes)	Maximum rate	TBS	rad/s	Attitude Command Generation
KP.Jerk_Time(PCAD Modes)	Jerk time	TBS	s	Attitude Command Generation
THE FOLLOWING K-CONSTANTS HAVE BEEN CONVERTED TO COMMANDABLE PARAMETERS NOW CONTAINED IN THE COMMAND "UPDATE BRIGHT STAR REFERENCE PARAMETERS"				
KP.Bright_Max_Mag	Faint magnitude limit	[-2.00, +13.94]	0.0625 mag	Bright Star Processing
KP.Bright_Min_Mag	Bright magnitude limit	[-2.00, +13.94]	0.0625 mag	Bright Star Processing
THE FOLLOWING K-CONSTANTS HAVE BEEN CONVERTED TO COMMANDABLE PARAMETERS NOW INCLUDED IN THE COMMAND "SET DITHER PARAMETERS"				
KP.Dither_P	Dither pitch angle coefficient	TBS	rad	Attitude Command Generation
KP.Dither_Y	Dither yaw angle coefficient	TBS	rad	Attitude Command Generation

Name	Description	Range	Units	Destination
THE FOLLOWING K-CONSTANTS HAVE BEEN CONVERTED TO COMMANDABLE PARAMETERS NOW CONTAINED IN THE COMMAND "UPDATE FIDUCIAL LIGHT REFERENCE PARAMETERS"				
KP.Fid_Delta_Y_Thresh	Fiducial light delta-Y threshold	TBS	rad	Identify Fiducial Lights, Bright Star Processing
KP.Fid_Delta_Z_Thresh	Fiducial light delta-Z threshold	TBS	rad	Identify Fiducial Lights, Bright Star Processing
KP.Fid_Dimension	Fiducial light window dimension	TBS	ND	Find Fiducial Lights
KP.Fid_High_Res	Fiducial light high resolution flag	TBS	ND	Find Fiducial Lights
KP.Fid_Sel	Fiducial light brightness / position selection indicator	TBS	ND	Find Fiducial Lights
KP.Fid_Size_SF	Fiducial light window size scale factor	TBS	ND	Fiducial Light Processing
KP.Fid_Thresh_SF	Fiducial light brightness threshold scale factor	TBS	ND	Fiducial Light Processing
THE FOLLOWING K-CONSTANTS HAVE BEEN CONVERTED TO COMMANDABLE PARAMETERS NOW INCLUDED IN THE COMMAND "UPDATE GUIDE STAR REFERENCE PARAMETERS"				
KP.Guide_Delta_Y_Thresh	Guide star delta-Y threshold	TBS	rad	Identify Guide Stars
KP.Guide_Delta_Z_Thresh	Guide star delta-Z threshold	TBS	rad	Identify Guide Stars
KP.Guide_Size_SF	Guide star window size scale factor	TBS	ND	Guide Star Processing
KP.Guide_Thresh_SF	Guide star brightness threshold scale factor	TBS	ND	Guide Star Processing

RecordMnemonic	Field	Mnemonic	Name	Description	Type	mens	Units
AFIDP	1	AFIDP01	AFIDP01 Filler		Bit	1	n/a
AFIDP	2	AFIDP02	Reset	Zero's all current levels when reset and disables Dmux addressing.	Bit	1	n/a
AFIDP	3	AFIDP03	Driver Dmux Address	Chooses the dmux being commanded.	Bit	2	n/a
AFIDP	4	AFIDP04	Dmux channel Enable		Bit	1	n/a
AFIDP	5	AFIDP05	Dmux Channel Select	0 - Channel 1, 1 - Channel 2, 2 - Channel 3, 3 - Channel 4, 4 - Channel 5, 5 -	Bit	3	n/a
AFIDP	6	AFIDP06	Current Level Command	0,1 - Off, residual current only	Bit	8	n/a
AOFUNCDS	1	AOPCADSF	PCAD_Subfunction	PCAD Subfunction Number. See DMO5	Byte	1	ND
QUAT	1	XQut3of4	1st 3 elements of a normalized quaternion	1st three elements of a normalize quaternion in 1750A extended floating	50FLX	3	nd
AOUPTARQ	1	AOUPTAR1	Update target quaternion cmd 1	1st command word of multi-part command	bit	28	nd
AOUPTARQ	2	AOUPTAR2	Update target quaternion cmd 2	2nd command word of multi-part command	bit	28	nd
AOUPTARQ	3	AOTARCMD	Q_Targ_Cmd	Commanded target quaternion	QUAT	1	
REFCAT	1	AOIMNUM	Im_Num	Image number	bit	3	nd
REFCAT	2	AOYANGLE	Y_Angle	Expected Y angle position in ACA coordinates	bit	20	rad
REFCAT	3	AOZANGLE	Z_Angle	Expected Z angle position in ACA coordinates	bit	20	rad
REFCAT	4	AOMAXMAG	Max_Mag	Faint Magnitude Threshold	bit	10	nd
REFCAT	5	AOMINMAG	Min_Mag	Bright Magnitude Threshold	bit	10	nd
REFCAT	6	AODIMDTS	Acq_Dim_or_DTS	Search box dimension (D) for stars or designated tracked star for monitor	bit	6	nd
REFCAT	7	AORESTRK	Acq_Res_or_Track	For Acquisition Stars indicates half-width of search region:	bit	1	nd
REFCAT	8	AOIMSIZE	Image_Size	Pixel readout pattern: 00=4x4_pixel_image 01=6x6_mouse_bit	bit	2	nd
REFCAT	9	AOENTYPE	Entry_Type	Type of Entry: 000=acquisition_star 001=guide_star	bit	3	nd
REFCAT	10	AOEFlr1	AOEFlr1 spare	filler	bit	5	nd
AOSTRCAT	1	AOCAT1	Update Star Catalog command 1	1st command word of a multi-part command	bit	28	nd
AOSTRCAT	2	AOCAT2	Update Star Catalog command 2	2nd command word of multi-part command	bit	28	nd
AOSTRCAT	3	AOCFlr2	AOCFlr2 spare	filler	bit	3	nd
AOSTRCAT	4	AOREFCAT	Ref_Cat	16 star catalog entries, unused entries zero filled	REFCAT	16	
AOSTRCAT	5	AORFlr3	AORFlr3 spare	filler	bit	9	nd
AOSTRCAT	6	AONUMENT	Num_Cat	Number of catalog entries for the OBC to expect 1-16	bit	4	nd
AOEDITCT	1	AOEDIT1	Edit Star Catalog Command 1	1st command word of a multi-part command	bit	28	nd
AOEDITCT	2	AOEDIT2	Edit Star Catalog Command 2	2nd command word of multi-part command	bit	28	nd
AOEDITCT	3	AOENTRY	Entry_Num	Entry Number to be edited	bit	3	nd
AOEDITCT	4	AOCATENT	Cat_Data	1 star catalog entry	REFCAT	1	
AOEDITCT	5	AOCFlr4	AOCFlr4 spare	filler	bit	14	nd
AOEDITCT	6	AOACXREF	Acq_Ref	Indicates which acquisition star if guide star is also acquisition star	bit	4	nd
AOACQPAR	1	AOACQPR1	Update Acquisition Star Reference Parameters	1st command word of a multi-part command	bit	28	nd
AOACQPAR	2	AOACQPR2	Update Acquisition Star Reference Parameters	2nd command word of multi-part command	bit	28	
AOACQPAR	3	AOAFlr5	AOAFlr5 spare	filler	bit	4	nd
AOACQPAR	4	AOACQADJ	Acq_F_Adjust	Type of adjustment to make to acquisition star search Parmeters (brightness	bit	2	nd
AOACQPAR	5	AOACSZSF	Acq_Size_SF	Acquisition Size Threshold	bit	10	
AOACQPAR	6	AOACTHSF	Acq_Thresh_SF	Acquisition Threshold Scale Factor	bit	12	
AOACQPAR	7	AOAFlr6	AOAFlr6 spare	filler	bit	3	nd
AOACQPAR	8	AOACQSEL	Acq_Select	Acquisition Select	bit	1	
AOACQPAR	9	AOACDELY	Acq_Delta_Y_Thresh	Threshold used for identifying pairs of acquisition stars see DM05 identify	50FL	1	
AOACQPAR	10	AOACDELZ	Acq_Delta_Z_Thresh	Threshold used for identifying pairs of acquisition stars see DM05 identify	50FL	1	
AOGUIPAR	1	AOGUIPR1	AOGUIPR1 Update Guide Star Reference Parameters	1st command word of a multi-part command	bit	28	nd

RecordMnemonic	Field	Mnemonic	Name	Description	Type	mens	Units
AOGUIPAR	2	AOGUIPR2	AOGUIPR2 Update Guide Star Reference Parameters	2nd command word of a multi-part command	bit	28	nd
AOGUIPAR	3	AOGUSZTH	Guide_Size_SF	Guide Star Search Box Size Scale Factor	bit	10	nd
AOGUIPAR	4	AOGUTHSF	Guide_Thresh_SF	Guide Star Minimum Magnitude Threshold Scale Factor	bit	12	nd
AOGUIPAR	5	AOGFlr7	AOGFlr7 spare	filler	bit	1	nd
AOGUIPAR	6	AOGUIDIM	Guide_Dimension	Guide Star Search Box Dimension	bit	5	
AOGUIPAR	7	AOGFlr8	AOGFlr8 spare	filler	bit	1	nd
AOGUIPAR	8	AOGUIRES	Guide_High_Res	High Resolution Flag	bit	1	
AOGUIPAR	9	AOGFlr9	AOGFlr9 spare	filler	bit	1	nd
AOGUIPAR	10	AOGUISEL	Guide_Sel	Guide Star Brightness/Position Indicator	bit	1	
AOGUIPAR	11	AOGUDELY	Guide_Delta_Y_Thresh	Threshold used for identifying guide stars	50FL	1	
AOGUIPAR	12	AOGUDELZ	Guide_Delta_Z_Thresh	Threshold used for identifying guide stars	50FL	1	
AOFIDPAR	1	AOFIDPR1	AOFIDPR1 Update Fid Light Reference Parameters	1st command word of a multi-part command	bit	28	nd
AOFIDPAR	2	AOFIDPR2	AOFIDPR2 Update Fid Light Reference Parameters	2nd command word of a multi-part command	bit	28	nd
AOFIDPAR	3	AOFISZSF	Fid_Size_SF	Fid Light Search Box Size Scale Factor	bit	10	
AOFIDPAR	4	AOFITHSF	Fid_Thresh_SF	Fid Light Minimum Magnitude Scale Factor	bit	12	
AOFIDPAR	5	AOFI10	AOFI10 spare	filler	bit	1	nd
AOFIDPAR	6	AOFIDDIM	Fid_Dimension	Fid Light Search Box Dimension	bit	5	
AOFIDPAR	7	AOFI11	AOFI11 spare	filler	bit	1	
AOFIDPAR	8	AOFIDRES	Fid_High_Res	Fid Light High Resolution Flag	bit	1	
AOFIDPAR	9	AOFI12	AOFI12 spare	filler	bit	1	nd
AOFIDPAR	10	AOFIDSEL	Fid_Sel	Fid Light Brightness/Position Indicator	bit	1	nd
AOFIDPAR	11	AOFIDELY	Fid_Delta_Y_Thresh	Fid Light Y Position Threshold	50FL	1	
AOFIDPAR	12	AOFIDELZ	Fid_Delta_Z_Thresh	Fid Light Z Position Threshold	50FL	1	
AOBRIPAR	1	AOBRIPR1	Update Bright Star Parameters Command 1	1st Command of a Multi-part command	bit	28	nd
AOBRIPAR	2	AOBRIPR2	Update Bright Star Parameters Command 2	2nd command of a Multi-part Command	bit	28	nd
AOBRIPAR	3	AOFI13	AOFI13 spare	filler	bit	4	nd
AOBRIPAR	4	AOBRIMAX	Bright_Max_Mag	Bright Star Maximum Magnitude	bit	12	
AOBRIPAR	5	AOFI14	AOFI14 spare	filler	bit	4	nd
AOBRIPAR	6	AOBRIMIN	Bright_Min_Mag	Bright Star Minimum Magnitude	bit	12	
AOIMSTAT	1	AOWINDOW	Image Window Number	Number for the image window being enabled or disabled	bit	3	nd
AOIMSTAT	2	AOFI15	AOFI15 spare		bit	4	nd
AOIMSTAT	3	AOACTIVE	Image Window Status	Status for each image window	bit	1	nd
AOSETINT	1	AOSTINT1	Set Integration Time Cmd 1	1st command of a multipart command	bit	28	
AOSETINT	2	AOSTINT2	Set integration Time Cmd 2	2nd command of a multipart command	bit	28	
AOSETINT	3	AOACACMD	ACA Command Code		bit	3	
AOSETINT	4	AOACTIME	ACA Integration Time	Integration Time : lsb = 1/4 minor cycle	bit	13	TBS
AOSETINT	5	AOFI16	AOFI16 spare	filler	bit	12	
AOATTUP	1	AOATTUP1	Update OBC Attitude command 1	1st command of a multipart command	bit	28	
AOATTUP	2	AOATTUP2	Update OBC Attitude Command 2	2nd command of a multipart command	bit	28	
AOATTUP	3	AOQATTUP	Q_Att_Update	Attitude Update Delta Quaternion	QUAT	1	
VEC	1	AOFI17	Single Precision Number in a 3 vector		50FL	3	
AOBIASUP	1	AOBIAS1	Update gyro drift estimate command 1	1st command of a multi-part command	bit	28	
AOBIASUP	2	AOBIAS2	Update gyro drift estimate command 2	2nd command of a multi-part command	bit	28	
AOBIASUP	3	AODRIFT	Drift_Update	Onboard Gyro Drift Estimate Correction Vector	VEC	1	

RecordMnemonic	Field	Mnemonic	Name	Description	Type	mens	Units
AOEPHMUP	1	AOEPHEM1	Update Ephemeris Command 1	1st command of a mult-part command	bit	28	
AOEPHMUP	2	AOEPHEM2	Update Ephemeris Command 2	2nd command of a multipart command	bit	28	
AOEPHMUP	3	AORATIO	A2P_Ratio	see SE36/DM05	50FL	1	
AOEPHMUP	4	AOARGPER	Arg_Per	see SE36/DM05	50FL	1	
AOEPHMUP	5	AOECCENT	Eccentricity	see SE36/DM05	50FL	1	
AOEPHMUP	6	AO1MINUS	Half_1mCosI	see SE36/DM05	50FL	1	
AOEPHMUP	7	AO1PLUS	Half_1pCosI	see SE36/DM05	50FL	1	
AOEPHMUP	8	AOMOTION	Mean_Motion	see SE36/DM05	50FL	1	
AOEPHMUP	9	AOITERAT	Num_Iterations	see SE36/DM05	bit	16	
AOEPHMUP	10	AORRBANG	Orb_Ang_Mom	see SE36/DM05	50FL	1	
AOEPHMUP	11	AOPERIGE	Perigee_Time	see SE36/DM05	50FL	1	
AOEPHMUP	12	AOASCEND	RA_Ascend_Node	see SE35/DM05	50FL	1	
AOEPHMUP	13	AOSINI	SinI	see SE35/DM05	50FL	1	
AOEPHMUP	14	AOSLR	SLR	see SE35/DM05	50FL	1	
AOEPHMUP	15	AOSQRTMU	Sqrt_Mu_A_Esq	see SE35/DM05	50FL	1	
AOMANPAR	1	AOMANPR1	Set Maneuver profile parameters command 1	1st command of a multipart command	bit	28	
AOMANPAR	2	AOMANPR2	Set Maneuver profile parameters command 2	2nd command of a multipart command	bit	28	
AOMANPAR	3	AOJERK	Jerk_Time	Jerk Time	50FL	1	sec
AOMANPAR	4	AOOMEGA	Omega_Max	Maximum Rate	50FL	1	rad/sec
AOMANPAR	5	AOALPMAX	Alpha_Max	Maximum Acceleration	50FL	1	rad/sec**2
AODITPAR	1	AODITPR1	Set Dither Parameters command 1	1st command of a multipart command	bit	28	
AODITPAR	2	AODITPR2	Set Dither Parameters command 2	2nd command of a multipart command	bit	28	
AODITPAR	3	AOANGP	Dither_Ang_P	Dither angle Pitch	50FL	1	
AODITPAR	4	AOANGY	Dither_Ang_Y	Dither angle Yaw	50FL	1	
AODITPAR	5	AOPHASEP	Dither_Coeff_P	Dither phase Angle Pitch	50FL	1	
AODITPAR	6	AOPHASEY	Dither_Coeff_Y	Dither phase Angle Yaw	50FL	1	
AODITPAR	7	AORATEP	Dither_Rate_P	Dither rate Pitch	50FL	1	
AODITPAR	8	AORATEY	Dither_Rate_Y	Dither rate Yaw	50FL	1	
AOPOSINT	1	AOMODE	PCAD Mode Number	0..Normal_Pointing 1..Normal_Maneuver 2..Sun_Acquisition_(NSM)	bit	3	nd
AOPOSINT	2	AOF1r18	AOF1r18 spare	filler	bit	4	
AOPOSINT	3	AOPOSEN	Enable/Disable Position Integration	0..Disabled 1..Enabled	bit	1	nd
AORWTQEN	1	AORWNUM	Reaction Wheel Number	0..Reaction_Wheel_1 1..Reaction_Wheel_2 2..Reaction_Wheel_3	bit	3	nd
AORWTQEN	2	AOF1r19	AOF1r19 spare		bit	4	
AORWTQEN	3	AORWSTAT	Reaction Wheel Enable/Disable	0..Disable 1..Enable	bit	1	nd
AOSETYAW	1	AOSETYW1	Set Yaw Bias Cmd 1	1st command of a multipart command	bit	28	nd
AOSETYAW	2	AOSETYW2	Set Yaw Bias Cmd 2	2nd command of a multipart command	bit	28	nd
AOSETYAW	3	AOYAWHLD	Sun_Yaw_Bias_Hold	Yaw Bias Rate for Hold Submode	50FL	1	
AOSETYAW	4	AOYAWPNT	Sun_Yaw_Bias_Point	Yaw Bias Rate for Point Submode	50FL	1	
AODESMOM	1	AODESMM1	Set Desired System Angular Momentum Command 1	1st command of a multipart command	bit	28	
AODESMOM	2	AODESMM2	Set Desired System Angular Momentum Command 2	2nd command of a multipart command	bit	28	
AODESMOM	3	AOMOMTOT	Mom_Tot_Cmd	Desired system Momentum vector	VEC	1	
AOMOMLIM	1	AOMOMLM1	Set system angular momentum limit command 1	1st command of a multipart command	bit	28	
AOMOMLIM	2	AOMOMLM2	Set system angular momentum limit command 2	2nd command of a multipart command	bit	28	
AOMOMLIM	3	AOMOMLIM	Mom_Tot_Lim	Total system momentum limit for angular momentum unloading	50FL	1	

RecordMnemonic	Field	Mnemonic	Name	Description	Type	mens	Units
AODIRECT	1	AODIRTYP	Directive Type	000=MUPS 001=RCS 010=RW 011=SA 100=LAE	bit	3	
AODIRECT	2	AOFI20	AOFI20 spare	filler	bit	3	
AODVBURN	1	AODBURN1	Set Delta-V Burn Time Command 1	1st command of a multipart command	bit	28	
AODIRECT	3	AODIRCMD	AODIRCMD Enable/Disable Flag	Enable/Disable Directive Flag	bit	1	
AODVBURN	2	AODBURN2	Set Delta-V Burn Time Command 2	2nd command of a multipart command	bit	28	
AODVBURN	3	AOBTIME	DV_Duration	Burn time duration	50FL	1	sec
AOFUNCEN	1	AOPCSF01	PCAD Subfunction for EN	PCAD Subfunction Number. See DMO5	Byte	1	n/a